MATHEMATICS TEACHER PERSONNEL AND ITS OPINIONS ABOUT THE TEACHING AND LEARNING OF GEOMETRY.

1964-1965

A THESIS

SUBMITTED TO THE FACULTY OF THE SCHOOL OF EDUCATION

ATLANTA UNIVERSITY

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE

DEGREE OF MASTER OF ARTS

BY

IRVIN JOSEPH FRANKLIN, SR.

SCHOOL OF EDUCATION

ATLANTA UNIVERSITY

ATLANTA, GEORGIA

AUGUST, 1966

Dedicated

To

My Wife and five children, Mrs. Margaret Franklin, Irvina, Irvin, Margaret, Shelia, and Mervin Franklin, for their encouragement and interest during the period of this research.

And To

Dr. Lawrence E. Boyd, who unselfishly supplied valuable information, advice and suggestions.

I. J. F.

ACKNOWLEDGEMENTS

The writer wishes to express his sincere thanks and appreciation to all who have contributed to the successful completion of this research. He wishes to express thanks to Dr. Edward K. Weaver, Advisor, for the immediate direction and guidance of this research; and to co-Advisor, Dr. Lawrence E. Boyd, for their guidance.

The writer wishes to acknowledge his indebtedness to the mathematics teachers in the Negro High Schools in New Orleans, 1964-1965, who executed the data-gathering instrument.

I. J. F.

TABLE OF CONTENT

LIST OF TABLES

CHAPTER I

INTRODUCTION

Rationale.-- In 1955 the space age was thrust upon us by the Russians. Immediately many officials of the United States asked why the United States was not first with such an outstanding achievement. As a result, various facets of our country, politicians, educators, armed force leaders, industrialists, and laymen became deeply concerned over the lost of the technical prestige of the United States. Thus, loud cries for answers to why the United States was not first, and how could it regain its lost pedestal, came from all of the above mentioned areas. When the proverbial smoke finally settled it seemed as though our educational system would have to bear the brunt of the attack.

Many school systems organized educational study committees. The duties of the committees were to study the mathematics courses from the first grade through the twelfth grade. After the committees had studied and analyzed the mathematics courses they made recommendations of what changes were to be made, if any. In many cases changes were recommended and put into operation. Along with the school system's evaluative study programs came programs of studies sponsored by the outstanding educational boards. The College Entrance Examination Board - the distinguished school and college

teachers who are responsible for the Board's entrance examination in mathematics-began to feel great concern about the curriculum they were testing.[1] Thus, as a result of this concern the College Entrance Examination Board created a Commission on Mathematics in August 1955.[2] Upon completion of their work the Commission on Mathematics published a report of their recommendations of necessary changes in grades nine through twelve.[3]

Evolution of the Problem.-- The problem involved in this study rose out of the desire of many school systems Department of Education's attempt to improve its mathematics curriculum. During the academicschool year of 1960-61 some issued directives granting local school board permission to include in their curriculum a course in plane geometry encompassing modern concepts.

The writer feels that being a part of the educational system of one of these systems, it is his duty to evaluate the new program in geometry and make comparisons with achievements of the students following the traditional program.

Contribution to Educational Knowledge.--It is believed that this study may provide some evidence that one concept

---

[1]College Entrance Examination Board, Program for College Preparatory Mathematics, a Report by the Commission on Mathematics, (New York, College Entrance Examination Board, 1951), p. 1

[2]Ibid., p. xi

[3]Ibid., p. 9

of teaching plane geometry to tenth grade students is superior to another in preparing students to meet the mathematical demands of this atomic age as set forth by the College Entrance Examination Board.

It is the desire of the writer that the findings of this research will motivate other school districts to adopt or deny the newer approach to the "new mathematics" as set forth here.

Statement of the Problem.-- The problem involved in this study was to determine and analyze the opinions which Orleans Parish High School mathematics teachers expressed concern over in the teaching of geometry.

Purpose of the Study.--The major purpose of this research was to make a thorough analysis of the opinions held by the mathematics teachers about the changes being brought about in the teaching of geometry.

More specifically, the purposes of this study were as follows:

1. To determine the opinions about the changes in the teaching of geometry in the high schools.
2. To ascertain to what extent the opinions held by the mathematics teachers can be utilized in evaluating the scope and nature of improvement of the teaching of geometry in the high schools.

Definition of Terms.--For the purpose of clarity, certain terms used in this study were defined as follows:

1. opinions refer to the judgment held as true and arrived at by intellectual process though not

necessarily based on evidence sufficient for proof.

Research Design.--The Descriptive-Survey Method of research employing the techniques of the questionnaire and the interview, was used to gather the data necessary to the pursuit of this study.

Procedure.-- The basic instrument used to gather the necessary data for this research was a questionnaire specifically designed and validated under the direction of instructional personnel in the School of Education, Atlanta University, Atlanta, Georgia.

The major purpose of this research was achieved through the following procedural steps:

1. The related literature pertinent to this study was reviewed, summarized, and is presented in the finished thesis copy.
2. The participants in this study were contacted to secure their cooperation and to orientate them as to the nature and scope of the proposed research problem.
3. Copies of the questionnaire were coded and distributed to all Negro mathematics teachers of Orleans Parish for 1964-1965 school year.
4. The data secured from the questionnaire was tabulated, analyzed, assembled into appropriate tables and interpreted in keeping with the nature and purpose of the research.
5. The findings, conclusions, implications, and recom-

mendations derived from the interpretations of the data are included in the contents of the finished thesis copy.

Possible Value of the Study.--It is hoped that the findings of this research will have the following value:

1. That this study will provide some evidence that one concept of teaching plane geometry to tenth grade students is superior to another in preparing students to meet the mathematical demands of this atomic age as set forth by the College Entrance Examination Board.
2. Derived evidence will motivate other school districts to investigate, adopt or deny the new approach to the teaching of geometry.

Description of Instrument.--The data for this study were gathered through a questionnaire-checklist, which had been devised for the purpose of this investigation. The questionnaire checklists, together with a letter of explanation were distributed to 52 mathematics teachers in the six Negro High Schools in New Orleans, Louisiana, 1964-1965. The questionnaire-checklist comprised eight categories: (1) Background of respondents working situation, (2) Personal information of respondent, (3) Geometric Objectives, (4) Methods of teaching geometric concepts, (5) Relationship of geometry to other subjects, (6) Organization and Level of Performance Placement, (7) Methods, and (8) Evaluation.

Locale.--The locale of this study was Orleans Parish,

New Orleans, Louisiana. It is a diversified Industrial and shipping center being the third largest port in the United States.

Subjects.-- The subjects involved in this study were the forty-seven mathematics teachers in the six Negro Senior High Schools of Orleans Parish, namely: Booker T. Washington, George Washington Carver, Walter L. Cohen, McDonogh No. 35, L. B. Landry, and J. S. Clarke. Hereafter the schools will be referred to as school A, B, C, D, E, and F respectively.

CHAPTER II

RELATED LITERATURE

Introductory Statement.-- A survey of literature pertinent to the program of mathematics with special references to the teaching of geometry reveals an abundance of materials. In order to facilitate the discussion, the following sequence of topics has been used:

1. The Nature and Purpose of Geometry.
2. Geometry as a Functional Part of theSecondary School Program.
3. Influence of National Committees on the Secondary Schools.
4. The Mathematics Curriculum of the Secondary Schools.
5. Objectives of Geometric Instruction.
6. Methods and Materials in Teaching Geometry.
7. Evaluation of Geometric Functions.
8. Training of Geometry Teachers.

The Nature and Purpose of Demonstrative Geometry.-- In order to understand the geometric program in the secondary school, one should consider at least two things; first, the nature of geometry, and second, the purpose of its teaching.

What does "geometry" mean? The term "geometry" concerns itself with "that branch of pure mathematics that treats of space and its relations; the science of the material relations of points, lines, angles, surfaces and solids; considered as

having no properties but those arising from extensions and difference of situation."

Reeve had this to say concerning the nature and purpose of geometry:

> The real purpose of demonstrative geometry. We must continually repeat and emphasize the fact that the purpose of demonstrative geometry is to make clear to the student the meaning of a demonstration, the meaning of proof. If demonstrative geometry is not taught in order to enable the student to have the satisfaction of proving something, to train him in deductive thinking, to give him the power to prove his own statements, then it is nor worth teaching at all.
>
> Someone may ask, "if training in constructive thinking is the big objective, why not give a course in pure logic?" The answer is that geometry furnishes appropriate figures, while pure logic does not. Demonstrative geometry can be justified only because it is mostly a course in deductive logic in contrast to inductive logic which is used in science. Science helps greatly to open the universe and so does mathematics. Neither should be overlooked in the student's education.
>
> The mere utilities of geometry have already been required before the student begins, if he ever does the work in what is to him an entirely new field- that of logical proof. The chief purpose of demonstrative geometry, then is to lead the student to understand what it is to demonstrate something, to prove a statement logically, and to "stand upon the vantage ground of truth." He sees a sequence of theorems built up into a logical system and he sees how this system is contructed, the result being a basis of proved statements which he can use for establishing further proof, precisely as a lawyer proceeds to construct his case, or a speaker to construct an argument.[1]

Further, Reeve comments on the nature of demonstrative geometry:

> To the mathematician his whole science rests upon the foundation of demonstrative geometry. Not until this subject is begun does the student really appreciate the significance of mathematics. It is here that

---

[1]William David Reeve, Mathematics for the Secondary School. (Henry Holt and Company, New York, 1954), pp. 334-335

> vigorous logic begins to be applied; it is here that the student first appreciates the step, "if this, then that." Here he comprehends the significance of the further chain of reasoning illustrated by the statements, "I can prove A if I can prove B; I can prove B if I can prove C; but I can prove C, and hence I can retrace my steps and prove A. By these two applications he is inducted into the domain of mathematical thought.[1]

Reeve believes that the teacher has the task of stimulating latent ability of the student to study mathematics:

> Some of our greatest mathematicians did not discover their power to succeed in the study of matehmatics until they studied geometry. Their interest was aroused through geometry. Newton was a poor student until he began to study geometry. The possibility of latent power places a heavy responsibility upon the teacher to give every ambitious student a chance to know the subject that he professes to teach, and to teach it so that his students shall enjoy it and see its significance.[2]

Geometry as a Functional Part of the Secondary School Program.--This section will discuss geometry as a functional part of the Senior High School.

Butler and Wren state the objective of geometric instruction in these words:

> "For those who can continue their study of geometry in the senior high school, intuition and experiment will still be an effective aid, but the major function of instruction will be to instill in the pupils an appreciation for the significance of logical demonstration; to acquaint them with effective methods of clear and impartial thinking, critical evaluation, and intelligent generalization; to train them in the techniques of truth, and to introduce them to the meaning of mathematical rigorkand precision.[3]

---

[1] Ibid., p. 335

[2] Ibid., p. 335

[3] Charles H. Butler and F. Lynwood Wren, The Teaching of Secondary Mathematics (New York: McGraw-Hill Book Cp., 1951), p. 54

The National Committee on Mathematics Requirements remarked that a program of mathematics should develop those:

> . . . powers of understanding and of analyzing relations of quantity of and space which are necessary to an insight into and control over our environment and to an appreciation of the progress of civilization in its various aspects, and to develop those habits of thought and of actions which will make those powers effective in the life of the individual.[1]

Influence of National Organizations on the Geometry Programs.--The review of related literature pertinent to this study would be incomplete if reference were not made to the important leadership offered from time to time by national committees on the teaching of mathematics and geometry. One of the first reports considered in this study is the report of the National Committee on the Teaching of Mathematics, issued in 1923 under the title, The Reorganization of Mathematics in Secondary Education.

Following is a summary of the outcome or results of this report made by the National Council of Teachers of Mathematics.

> This report furnished important leadership for the future direction of mathematical education in the United States; it not only provided a statement of objectives and aims, but it suggested several different methods of organizing subject matter in mathematics for the junior and senior high schools, it encouraged experimentation with new subject matter in the senior high school, and it provided teachers with an account of the latest developments in certain aspects of mathematical education. It summarized the important trends in mathematical thinking at the school stage, and showed teachers of mathematics in the United States,

---

[1]National Committee on Mathematical Requirements, The Reorganization of Mathematics in Secondary Education. (Boston: 1923), pp. 13-14

the way toward better teaching of the subject.[1]

Objectives of Geometrical Instruction.--The paragraphs to follow deal with the objectives of geometrical instruction.

The Commission on Mathematics stated in its report the objectives of geometric study consists of three main objectives:

> The first objective is the acquisition of information about geometric figures in the plane and space. Since geometry originated as, and still is a mathematical model of the physical world, the student needs to know the facts of geometry if he is to be able to deal effectively with the world about him. This knowledge is important for the everyday citizen and essential for the prospective scientist. Moreover, little progress can be made in trigonometry or calculus without an understanding of geometric facts.
>
> The second objective is the development of an understanding of the deductive method as a way of thinking, and a reasonable skill in applying this method of mathematical situations. For historical reasons, the deductive method has been emphasized in geometry, but not elsewhere in high school mathematics. However, it is now possible and desirable to use the deductive method in all mathematical subjects, and consequently the time devoted to it in geometry can be somewhat reduced.
>
> Not all reasoning is syllogistic or deductive. Training in mathematics based on deductive logic does not necessarily lead to an increased ability to argue logically in situations where insufficient data exist, and where strong emotions are present. It is a disservice to the student and to mathematics for geometry to be presented as though its study would enable a student to solve a substantial number of life problems by syllogistic and deductive reasoning.
>
> Deductive methods are taught primarily to enable the student to learn mathematics. Mathematics, and consequently deductive methods, can be applied to life only in those life situations that are capable of

---

[1]National Council of Teachers of Mathematics, The Training of Mathematics Teachers. Fourteenth Yearbook. (New York, 1939), p. 30

> accurate transformation into mathematical models. These situations, though of tremendous importance, are far from frequent in the everyday lives of high school students.
>
> A third objective of the geometry course is the provision of opportunities for original and creative thinking by students. The material of elementary geometry affords an uncommonly good opportunity for students to think along lines that are original for them. Its elements are sufficiently simple to be grasped readily and its consequences sufficiently complex to challenge students of varying abilities, no matter how high. Therefore, a large part of the course should be devoted to original exercises involving, if possible, both the discovery of relationships and their proofs.[1]

Methods and Materials in Teaching Geometry.-- In reviewing the literature on methods of teaching secondary mathematics three books tended to give some clear explanation; these books are The Teaching of Mathematics by Davis, Teaching in High School by Douglas and Mills, and The Teaching of Secondary Mathematics by Butler and Wren.

Methods may be divided into two types (1) those used in teaching new material and (2) those which teach for permanences of the topics presented.

There are several methods of teaching new material. Among these is the heuristic method. Davis stated:

> In a small class which can be adapted to the tutorial system, the heuristic method proves most effective. The word heuristic stems from the Greek word meaning, "I find" and implies the active search of the learner after truth. It is the function of the teacher to direct the line of activity but to give direct assistance only when necessary. The student is led to formulate the accepted rules of procedure and fundamental concepts as if he were playing the role of

---

[1]Commission on Mathematics, Program for College Preparatory Mathematics. College Entrance Examination Board, (New York,1959), pp. 22-23

the discoverer. This method is well adapted to the ultimate objective of making the student a self-confident and independent worker.[1]

In this same connection, Butler and Wren asserted:

> Skillful use of the heuristic method tends to develop an attitude of mind which is most favorable to successful work in mathematics. A variation of this procedure (sometimes called the genetics method) aims to retain its spirit and advantages and at the same time to remove some of its limitations by having the questions directed by the entire class or groups instead of merely to one individual. Thus, the intention is that the class will be guided toward discoveries as a cooperating group rather than as separate individuals.[2]

In contrast to the heuristic method is the lecture method. Butler and Wren have pointed out:

> No mere lecture procedure such as is commonly used in college classes will suffice for the job of teaching secondary-school mathematics, but there are many times when judicious telling or explanations may be not only proper and valuable but absolutely necessary as for example, in making clear the meaning of new terms and concepts. Such use of the "telling" or lecture method in secondary school mathematics, however, should generally take the form of explanations or illustrations and these should not be protracted longer than necessary. Moreover, the discussion should not be one-sided. It should be so interpreted by the teacher who should also strive to elicit questions and contributions from the class.[3]

Of the laboratory method Butler and Wren stated:

> The laboratory method is another procedure for stimulating activity and discovery on the part of the students and for avoiding the disadvantages of the lecture method. As the name implies, the idea underlying this method of teaching is that students will develop new concepts and understandings particularly well through

---

[1]David R. Davis, The Teaching of Mathematics. (Cambridge: Addison-Wesley Press, Inc., 1951), p. 132

[2]Butler and Wren, op.cit., p. 159

[3]Ibid., p. 164

> experimental activities dealing with concrete situations such as measuring and drawing, weighing, counting, averaging, estimating, taking readings, comparing, analyzing, classifying and checking data, and deriving original quantitative data from concrete physical situations.[1]

The preceding methods of teaching referred to the presenting of new material to the students, of discussing it with them, and of giving them their first basic understandings of it. The task of the teacher now should be that of guiding and directing their work, stimulating them, encouraging them, helping them over hard spots, evaluating their progress, and in every way possible striving to get them to put forth their best efforts to achieve a permanent and functional mastery of the material upon which they are working.

Butler and Wren have given a good discussion of the directed-study method:

> Under the recitation and home work plan of teaching mathematics the students are often compelled to do their studying under conditions physically and psychologically unfavorable to effective work. Many homes are not so arranged as to make it possible for the children to have suitable desks in quiet rooms where they can study to advantage. Most schools maintain some form of study hall during school hours. Nearly all students need help at times, but in many cases the teachers who are in charge of study periods have had so little training in mathematics that they are unable to be of any assistance in helping students over difficulties or in directing their work in this field. The one person who is best qualified to do this is the mathematics teacher himself. The time and place where it can be done to best advantage is is directly in the mathematics class. There the student can address himself completely to the mathematical work

---

[1]Butler and Wren, op. cit., p. 158

and can receive such assistance as he may need from the teacher who is in charge of this work and who is therefore in a better position than anyone else to give the proper attention, assistance and direction.[1]

Of the drill method, Davis points out:

> By this method the learner is required toapply repeatedly a particular process or concepts until his mental reaction is immediate and accurate. It is often misused and overworked in the sense that the learner is requested to follow meaningless rules or directions without adequate explanation of their derivation and interpretation. . . On many occasions the formal drill method should be used, and it is commonly employed for the assimilation of the fundamental processes, operations with signed numbers, and the evaluation of formulas . . . An important meansof motivation in the drill method is to provide a diversity of material that requires repeated use of the desired drill.[2]

Butler and Wren has this to say as regards the review:

> Review is sometimes mistakenly identified with drill because they are both characterized by repetition and because they both aim at the fixation of reactions, concepts, or relationships. Drill is concerned chiefly with the automatization of a relatively detailed processes and reactions, whereas review has a dual function. It aims not only at the fixation and retention of facts, processes, and concepts, but also at the thoughtful organization of the details of subject matter into a coherent whole in order that the relationship of the various parts to each other and to the whole may be clearly understood. Review is usually concerned with more or less comprehensive units of subject matter, whereas drill is generally upon details.

Concerning the project method, Davis asserted:

> In this method of procedure, a particular object or assigned task is worked out by each student, who is usually required to make a written report showing the work accomplished and theresults attained . . . The

---

[1] Ibid., p. 164

[2] Davis, op. cit., pp. 34-35

project method is especially designed to take care of individual differences.[1]

The paragraphs to follow discuss materials of instructions needed in the teaching of secondary geometry.

Douglas and Mills had this to say concerning textbooks and workbooks:

> As a teaching device in most subjects the testbook occupies a unique place and performs a unique function. It is an extremely important feature of the American educational plan because it largely determines the content and organization of the courses of study in many subjects. This is particularly true of the courses in mathematics . . . In recent years a large volume of supplementary material has appeared in the form of workbooks than have textbooks, and approval of them is not unanimous.[2]

Butler and Wren had this to say as regards teaching aids:

> Blackboard protractors, compasses and rulers are almost indespensable and should form a part of the equipment of every mathematics classroom . . .Blackboard stencils for certain of the most commonly used figures are useful in economizing time and in providing accurate blackboard diagrams . . . Other classroom equipment, which is not often found but which would be distinctly worthwhile, include such items as drawing boards, T-squares, draftsman triangles, parallels rulers, and the pantograph.[3]

Reeve added:

> While the olinometer and sextant and the transit may be considered by some to be luxuries they are necessary if we are to fully develop the concepts of angles in the vertical, such as angles of elevation and angles of

---

[1]Davis, op.cit., pp. 34-35

[2]Earl B. Douglass and Robert H. Mills, Teaching in High School (New York: The Ronald Press Company, Inc., 1951), p. 103

[3]Butler and Wren, op. cit., p. 116

depression, as well as horizontal angles. Other materials of instruction include audio-visual aids, posters and charts.[1]

Evaluation of Geometry Instruction.--After employing methods and materials in the teaching of secondary mathematics, there is need to check the effectiveness of the instruction. This part of the related literature discusses the place of evaluation in mathematics instruction.

On purposes of evaluation, the National Council of Teachers of Mathematics, in the Fifteenth Yearbook, The Place of Mathematics in Secondary Education stated:

> Many teachers would assert that the chief purpose of testing is to provide a basis for assigning marks . . . But test are given for many other purposes, among which are the following: to maintain standards, to select and reject pupils, to discover strength and weaknesses of individual pupils or of the class as a whole, to provide a powerful incentive to study, to furnish a convenient method of instruction, to stimulate or even enforce improvement of teaching, to afford a basis for the appraisal of teachers and departments, to serve as a basis for accrediting schools and colleges, to furnish data for educational guidance, to accumulate materials for research.[2]

Along this line, Monroe said:

> Teaching success in mathematics depends very materially upon the effective use of diagnostic techniques and the complementary remedial procedures. A carefully constructed testing program is essential to any efficient effort at diagnosis.[3]

---

[1]Reeve, op.cit., p. 490

[2]National Council of Teachers of Mathematics, The Place of Mathematics in Secondary Education, Fifteenth Yearbook (New York: Bureau of Publications, Teachers College, Columbia University, 1940), 0. 106

[3]Walter S. Monroe, Encyclopedia of Educational Research (New York: The MacMillan Company, 1950), p. 722

Concerning tests, Reeve asserted:

> If students have had difficulties in learning, well-organized tests will help teachers to diagnose their troubles and to provide remedial instruction that will alleviate the difficulties.[1]

Monroe insisted that "The intelligent instruction and use of tests are necessary prerequisites to any evaluation program, if it is to function with maximum efficiency."

Further, Monroe stated:

> In the measurement of achievement the purpose of the testing program must be not only to measure mechanical proficiency through more or less sterotyped answers to mere factual questions, but also to measure the understanding of concepts, techniques and principles through thoughtful answers to pointed questions.[2]

Butler and Wren had this say of evaluation:

> Evaluation has a very definite place in the learning process which takes place in secondary mathematics. The program of evaluation should be designed in terms of the functional aims as well as of the factual aims of mathematics instructions. Carefully selected techniques of evaluation should be used in determining to what extent these aims have been realized by pupils, both as individuals and as groups. Furthermore, it should be constantly emphasized that the most significant function of effective evaluation include not merely its use as an aid in determining pupil's marks but its use as an aid to instruction.[3]

Training of Mathematics Teachers.-- This section of the survey of related literature deals with the training of secondary mathematics teachers.

Butler and Wren believe:

> The future of mathematics in the secondary schools is primarily the responsibility of the teacher of mathematics in these schools. Its status will depend

---

[1]Reeve, op.cit., p. 490

[2]Monroe, op.cit., p. 722

[3]Butler and Wren, op. cit., p. 204

largely upon his ability to present and interpret this subject as a worthwhile educational venture. The professional preparation of this teacher should equip him with the scholarship and techniques essential to the satisfactory fulfillment of his professional organization. He must be able to organize and present mathematics in such a way that adolescent boys and girls will be brought not only to a realization of the intrinsic nature an and value of mathematics itself but also to an equally clear realization of its role in enabling man to relate, understand, and control his environmental factors and to direct his social and economic advancement.[1]

A bulletin of the U.S. Office of Education asserted:

> The program for the professional preparation of a teacher of mathematics should equip him with a broad cultural background, a sound philosophy of education, an appreciation of teaching as a profession and mathematics as a subject, and a desire to contribute to the program of better teaching. This program should also furnish the psychological training essential to sympathetic analysis of those mental, physical and social traits characteristics of the adolescent population of the secondary school.[2]

Further, the bulletin stated:

> The demands made on the teacher of secondary school mathematics strives to function in the modern program of education make it absolutely essential that he know the orientation of his field of work, in the entire secondary program; that he be familiar with significant objectives and problems in secondary mathematics; that he know the techniques of the selection of textbooks, workbooks, and other teaching equipment; that he be familiar with the fundamental philosophy of significant evaluation of instruction; that he be skilled in the use and interpretation of test-facts and functional, standardized, objective and essay, that he be acquainted with various instructional techniques and know when and

---

[1] Butler and Wren, op.cit., p. 343

[2] U.S. Office of Education, National Survey of the Education of Teachers. Bulletin 1933, No. 10 Volume III as cited in the S. W. Monroe, Encyclopedia of Educational Research (New York: The MacMillan Company, Inc., 1950),p.723

> how to use them for maximum efficiency; that he be prepared to assume his share of the responsibility in the pupil-guidance program; and that he be familiar with the more significant techniques of educational experimentation and research.[1]

W. J. Moulton supports this point of view when he advocated:

> A breadth of training for teachers of mathematics will insure a degree of familiarity with language literature, fine arts, natural science and social science, as well as mathematics, for if he is to be recognized as an educated man to whom adult members of the community may turn for consultation on intellectual matters, he must not be ignorant in what is commonly regarded as fundamentals of general culture . . . It is highly important for the prospective teacher whose major interest is in mathematics to prepare himself for teaching other subjects as well.[2]

The National Council of Teachers of Mathematics breaks teacher training into two aspects, (1) academic and (2) professional, and found the following statements to be indicative of the training received by prospective mathematics teachers in the United States. The statements to follow concern academic training.

1. In the three types of institutions (universities, colleges, and teachers colleges) mathematics, along with other subjects is organized in units, each of which is studied for two or three hours a week for one semester (18 weeks). Two, three, or four credit points are allowed for each unit of work successfully completed.

2. Mathematics may be taken as a major or minor subject of study; specialization in mathematics usually begins in the junior year for those who wish to take mathematics as a major subject.

---

[1] Ibid., p. 723

[2] F. J. Moulton, "Report on the Training of Teachers of Mathematics," American Mathematical Monthly, XLIII, (May, 1935) pp. 263-277

3. On the average slightly more credits in mathematics are earned by students who study mathematics as a major subject in universities and colleges than in teachers colleges.

4. Students who study mathematics as a minor subject usually do so with physical sciences, English, and social sciences as major subjects. When mathematics is studied as a major subject one of these three subjects is taken as a minor subject.

5. The mathematical courses taken in those institutions by mathematics majors and minors are adequate to cover the certification requirements in the home state and frequently in several adjacent states.

6. The mathematical subjects most frequently offered in those institutions are as follows:

   Freshman year: algebra, trigonometry, analytic geometry, elements of calculus

   Sophomore year: differential and integral calculus, analytic geometry

   Junior year: analytic geometry (3 dimensions), calculus, differential equations, statistics

   Senior year: Advanced calculus, theory of equations, projective geometry, statistics, history of mathematics

   It will be noted that the freshman year is devoted largely to work which is offered in secondary schools, but which pupils did not take at school.

7. Really advanced mathematics is taught chiefly in graduate courses; consequently graduates from teachers colleges and liberal arts colleges do not normally include in their mathematical training study of the more advanced branches of modern pure mathematics.

8. In teachers colleges there is a trend toward organizing the mathematics courses so as to relate the academic and professional aspects of the subjects in which is called professionalized subject matter. This trend has not been followed by universities and colleges.

9. It is pointed out that opportunities for in-service training in mathematics is available through the many institutions which offer summer courses in

> mathematics, but it is also pointed out that teachers make less use of summer courses for improving their academic qualifications in mathematics than for improving their professional qualifications.[1]

The National Council of Teachers of Mathematics made the following statements concerning professional training.

1. The minimum requirements in professional subjects are prescribed by certifying agencies, and these minimum requirements are realized in the three types of training institutions in the United States.

2. There is a difference in the emphasis placed on the professional aspects of training as between the liberal arts colleges of universities and colleges on the one-hand, and the schools of education and teachers colleges on the other hand. The former seem to favor the fairly definite separation of the academic from the professional aspects of training, while the latter appear to favor the course of training which duly emphasizes both aspects of training and which aims to professionalize the subject matter.

3. The college group favors a modicum theory and considerable experience of teaching as elements in professional training, while the teachers colleges and schools of education in universities lean more heavily to theory without reducing the requirements of practice teaching.

4. Special methods courses in the teaching of mathematics are offered in most of the teacher-training institutions, and usually about fifty lecture hours are devoted to them.

5. Practice teaching is advocated as a necessary part of the preparation of mathematics teachers, but is regarded as a privilege to be granted to those specially fitted to undertake it.

6. On the whole the experience in teaching gained by prospective teachers, during practice teaching periods tend to lack variety being too often confined to a single class and to a single unit of work.

7. In a few graduate schools of education a wide

variety of special methods courses in mathematics is offered.

8. In-service professional training is provided in the sessions which many training institutions hold during the summer months. Except in the larger institutions, the professional courses for mathematics teachers offered during summer sessions consist of courses in the teaching of arithmetic and of mathematics.

9. Opportunities for in-service training are also provided by three associations of mathematics teachers through their publications. (1) The National Council of Mathematics in its yearbooks and journals, The Mathematics Teacher. (2) The Central Association of Mathematics and Science Teachers in its journal School Science and Mathematics. (3) Mathematical Association of America in its journal The American Mathematical Monthly.[1]

William C. Bagley, in regard to the training of teachers of mathematics had this to say:

> The professional program for prospective teachers is something more than its curriculum offerings or requirements. It includes the life of the school itself, which should provide many opportunities for informal contacts between instructors and students, and also the teaching which goes on in the classrooms. Enthusiam for one's work and the devotion to the interests of the learner are qualities of the artist teacher for which there are no substitutes, and these qualities are not taught to the novice, they are rather caught from his instructors if his instructors exemplify them in a striking way.[2]

Summary of the Related Literature.--The summarization and interpretation of the related literature pertinent to this research are presented in the following statements.

---

[1]William C. Bagley, "The Ideal Preparation of A Teacher of Secondary Mathematics from the Point of View of an Educationalist," Mathematics Teacher, XXVI (May, 1933), p.276

[2]Ibid., pp. 140-141

> Reeve, on the nature and purpose of geometry, describes geometry as the only secondary school course that can instill in the student the ability to reason deductively. Thus, the purpose of requiring students to study geometry is to give them an understanding of deductive reasoning and to make it possible for them to continue further in other branches of science and mathematics.[1]

Butler and Wren, in speaking on geometry as a functional part of the secondary curriculum, say that the major purposes of the course will be to instill in the students an appreciation for the significance of logical demonstration; to acquaint them with effective methods of clear, impartial thinking, critical evaluation, and intelligent generalization, to train them in the techniques of discovery of truth, and to introduce them to the meaning of mathematical vigor and precision.[2]

---

[1] Reeve, op.cit., p. 334

[2] Butler and Wren, op.cit., p.397

CHAPTER III

PRESENTATION AND ANALYSIS OF DATA

Introductory Statement.-- The purpose of this chapter is to present, analyze, and interpret the data derived from the returned questionnaires from the mathematics teachers of the Negro Senior High Schools in New Orleans who co-operated in this study. The presentation, analysis, and interpretation of the data have been organized under the following captions.

1. General Information
2. Objectives of Geometry
3. Teaching Methodology of Geometry Teachers
4. Promotion of Learning in Geometry
5. Determining the Extent to which the Objectives of Geometric Learning are Achieved.

General Information

Number of Teachers in Mathematics Department-- The data on the number of teachers in the Mathematics Department of the Negro Senior High Schools in New Orleans 1964-65, who participated in this research are prsented in Table 1, page 34, which shows the significant facts to follow.

The number of teachers in the Mathematics Department of the six schools ranged from a low of 4 or 13.33 per cent in school F to a high of 9 or 15.51 per cent in school C.

A summary of the data shows that there was a total of

TABLE 1

DISTRIBUTION OF THE NUMBER OF TEACHERS IN THE MATHEMATICS DEPARTMENTS OF THE NEGRO SENIOR HIGH SCHOOLS IN ORLEANS PARISH, 196465

School	Number of Teachers in all Departments of Schools Reporting	Number of Teachers in Mathematics Departments	Per Cent of Teachers in Mathematics Departments of each School
A	102	12	11.76
B	92	9	9.78
C	58	9	15.51
D	54	8	14.81
E	47	5	10.65
F	30	4	13.33

47 teachers employed in the Mathematics Department of the six Negro High Schools in New Orleans during the school year of 1964-65.

Number of Mathematics Teachers Teaching Geometry.--The data on the number of teachers in the Mathematics Department teaching geometry in the Negro Senior High Schools in New Orleans, 1964-65,are presented in Table 2, page 27.

The number of mathematics teachers teaching geometry in the Mathematics Departments range from a low of 1 out of 9 or 11.11 per cent in school C to a high of 3 out of 4 or 75 per cent.

TABLE 2

DISTRIBUTION OF THE NUMBER OF MATHEMATICS TEACHERS TEACHING GEOMETRY IN THE NEGRO SENIOR HIGH SCHOOLS IN ORLEANS PARISH, 1964-1965

School	Number of Teachers in Mathematics Departments	Number Teaching Geometry	Per Cent of Mathematics Teachers Teaching Geometry
A	12	5	41.66
B	9	7	77.77
C	9	1	11.11
D	8	3	37.50
E	5	1	20.00
F	4	3	75.00

A summary of the data shows that there was a total of 20 mathematics teachers teaching geometry of the 47 or 42.55 per cent in the six Negro High Schools in New Orleans during 1964-65.

Enrollments of the Schools and the Mathematics Departments.--The data on the enrollment of the schools and the Mathematics Departments of the six Negro Senior High Schools in New Orleans, Louisiana, 1964-65, are presented in Table 3, page 28.

The number of students enrolled in mathematics range from a low of 690 in school C, out of 1369 or 50.40 per cent, to a high of 449 in school F, out of 470 or 91.65 per cent.

TABLE 3

DISTRIBUTION OF THE ENROLLMENTS IN THE RESPECTIVE SCHOOLS AND MATHEMATICS DEPARTMENTS OF THE NEGRO SENIOR HIGH SCHOOLS OF ORLEANS PARISH, 1964-65

School	School Enrollments	Number of Students in Mathematics Departments	Per Cent of Students in Mathematics Departments
A	2738	1926	70.12
B	2064	1350	65.41
C	1369	690	50.40
D	1274	1031	80.92
E	1264	1156	91.45
F	479	449	91.65

A summary of the data shows that out of the grand total of 9188 students there was a total of 6596 or 71.89 per cent enrolled in mathematics in the six Negro Senior High Schools in New Orleans during 1964-65.

Number of Mathematics Students Enrolled in Geometry.--The data on the number of mathematics students enrolled in geometry classes of the six Negro Senior High Schools of New Orleans during 1964-65 are presented in Table 4 on page 29.

The number of mathematics students enrolled in geometry classes ranged from a low of 145 in school A out of 1920, or 7.55 per cent to a high of 1050 in school B out of 1350 or 79.26 per cent.

TABLE 4

DISTRIBUTION OF THE ENROLLMENTS IN THE MATHEMATICS DEPARTMENTS AND GEOMETRY CLASSES OF THE NEGRO SENIOR HIGH SCHOOLS OF ORLEANS PARISH, 1964-1965

School	Number of Students in Mathematics Classes	Number of Students in Geometry Classes	Per Cent of Students in Geometry Classes
A	1920	145	7.55
B	1350	1050	79.26
C	690	165	22.32
D	1031	376	36.47
E	1156	162	14.01
F	449	145	32.29

A summary of the data shows that there was a total of 2043 students enrolled in geometry out of a total of 6596 students in the six Negro Senior High Schools in Orleans Parish, Louisiana, 1964-65.

Have you Attended a National Science Foundation Institute in Mathematics?--Table 5, page 30, presents the data on the number of respondents who attended National Science Foundation Institutes in Mathematics. It was revealed that 22 of the 47 teachers or 46.81 per cent had attended and 25 of the 47 or 53.19 per cent had not attended.

Academic Level Attained by the Mathematics Teachers.--

The data on the academic levels attained by the mathematics teachers in the Negro Senior High Schools of

DISTRIBUTION OF THE RESPONSES TO THE QUESTION, HAVE YOU ATTENDED A NATIONAL SCIENCE FOUNDATION INSTITUTE IN MATHEMATICS AS OBTAINED FROM THE MATHEMATICS TEACHERS IN THE NEGRO SENIOR HIGH SCHOOLS IN ORLEANS PARISH, 1964-1965

Response	Number	Per Cent
Yes	22	46.81
No	25	53.19

1964-65 are presented in Table 6, page 31, which shows the following: 43 or 91.42 per cent of the mathematics teachers have Bachelor degrees as the highest level attained. Two or 4.29 per cent of the mathematics teachers have the Master of Arts degree as the highest level attained, with 2 or 4.29 per cent having the Master of Science degree as the highest level attained.

The Age Distribution of the Mathematics Teachers.--The data on the distrubution of the ages of the mathematics teachers in the six Nwgro Senior High Schools of Orleans Parish, Louisiana, are presented in Table 7, page 32. It was noted that 18 of the matehmatics teachers in this study ranged from 28 and 35 years of age or 38.30 per cent which is a majority. The next highest was 12 who ranged from between 36 and 45 years of age or 25.53 per cent. The third highest was 7 who ranged between 46 and 55 or 14.89 per cent. The two lowest were at each extreme. Five ranged 25 and under or 10.64 per cent and 5 ranged 56 or more or 10.64 or 10.64 per cent.

TABLE 6

DISTRIBUTION OF DEGREES EARNED BY THE MATHEMATICS TEACHERS EMPLOYED IN THE NEGRO SENIOR HIGH SCHOOLS IN ORLEANS PARISH, LOUISIANA 1964-1965

Degree Earned	Number	Per Cent
Bachelor of Arts	43	91.42
Bachelor of Science	2	4.29
Master of Arts	2	4.29
Master of Science	0	00.00

Mathematics Courses Completed by Mathematics Teachers.--Table 8, page 33, presents the data on the major mathematics courses completed by the mathematics teachers employed in the six Negro Senior High Schools of New Orleans, 1964-65.

These data revealed the number and per cent of teachers who had completed the respective mathematics courses to be as follows: 14 or 29.78 per cent completed advanced algebra; 47 or 100 per cent completed college algebra; 15 or 31.92 per cent indicated that the teacher had taken modern algebra; 2 or 4.26 per cent had taken analysis; 3 or 6.38 per cent had taken applied mathematics; 1 or 2.13 per cent had taken business mathematics; 18 or 38.30 per cent had taken advanced calculus; 32 or 68.08 per cent had taken differential calculus; 22 or 46.81 per cent had taken integral calculus; differential equation was indicated as having been taken by 6 or 12.76

TABLE 7

DISTRIBUTION OF THE AGE GROUP OF THE MATHEMATICS IN THE NEGRO SENIOR HIGH SCHOOLS OF ORLEANS PARISH, 1964-65

Age Group	Number	Per Cent
25 years or younger	5	10.64
26 - 35	18	38.30
36 - 45	2	25.53
46- 55	7	14.89
56 years or older	5	10.64

per cent; theory of equation was indicated as having been taken by 6 or 12.76 per cent of the teachers; 14 or 29.78 per cent had taken fundamentals of mathematics; 7 or 14.89 per cent of the teachers had taken solid geometry; solid analytic geometry was indicated as having been taken by 2 or 4.26 per cent of the teachers; 2 or 4.26 per cent of the teachers had taken synthetic projective geometry; history of mathematics was indicated as having been taken by 4 or 8.52 per cent of the teachers; and 28 or 59.56 per cent of the teachers indicated that they had taken plane trigonometry.

College Majors of the Mathematics Teachers.-- Table 9, page 34, presents the data on the major field in the college training of the mathematics teachers in the Negro Senior High Schools of New Orleans, 1964-65.

These data revealed the significant facts to follow:

TABLE 8

DISTRIBUTION OF MATHEMATICS COURSES COMPLETED BY MATHEMATICS TEACHERS EMPLOYED IN THE SIX NEGRO SENIOR HIGH SCHOOLS IN ORLEAN PARISH, LOUISIANA, 1964-1965

Mathematics Courses	Number of Teachers Taking Course	Per Cent of Teachers Taking Course
Algebra		
Advanced	14	29.78
College	47	100.00
Modern	15	31.92
Analysis	2	4.26
Applied Mathematics	3	6.38
Business Mathematics	1	2.13
Calculus		
Advanced	18	38.30
Differential	32	68.08
Integral	22	46.81
Equations		
Differential	6	12.76
Theory of	6	12.76
Fundamentals of Mathematics	14	29.78
General Mathematics	7	14.89
Geometry		
General College	3	6.38
Solid	7	14.89
Solid Analytic	2	4.26
Synthetic Projective	2	4.26
History of Mathematics	4	8.52
Plane Trigonometry	28	58.56

23 or 48.97 per cent of the mathematics teachers majored in mathematics; 1 or 2.13 per cent of the teachers majored in music; 3 or 6.39 per cent of them indicated a major in English; 2 or 4.26 per cent earned a major in physical science

TABLE 9

DISTRIBUTION OF THE COLLEGE MAJORS PURSUED BY THE MATHEMATICS TEACHERS IN THE NEGRO SENIOR HIGH SCHOOLS IN ORLEANS PARISH, LOUISIANA, 1964-1965

Major	Number	Per Cent
Mathematics	23	48.94
Music	1	2.13
English	3	6.39
Biological Science	2	4.26
Physical Education	1	2.13
Foreign Language	1	2.13
General Science	7	14.86
Social Science	5	10.64
Chemistry	4	8.52

1 or 2.13 per cent indicated a major in physical education; 1 or 2.13 per cent indicated a major in foreign language; 7 or 14.86 per cent of the teachers had majored in general science; 5 or 10.64 per cent of the teachers indicated social science as their college major; and 4 or 8.52 per cent of the mathematics teachers indicated chemistry as their major college training.

College Minors of the Mathematics Teachers.--Table 10, page 35, presents the data on the minors in the academic training of the mathematics teachers in the Negro Senior High Schools in New Orleans, 1964-65.

TABLE 10

DISTRIBUTION OF THE COLLEGE MINORS PURSUED BY THE MATHEMATICS TEACHERS IN THE NEGRO SENIOR HIGH SCHOOLS IN ORLEANS PARISH, LOUISIANA, 1964-1965

Minors	Number	Per Cent
Biology	2	4.26
Chemistry	1	2.13
French	2	4.26
Social Science	5	10.64
General Science	7	14.86
Mathematics	7	14.86
Physical Education	1	2.13
No Minor Indicated	22	46.81

The significant facts revealed were as follows: 2 or 4.26 per cent of the teachers indicated a minor in biology; 1 or 2.13 per cent indicated a minor chemistry; 2 or 4.26 per cent indicated a minor in French; 5 or 10.64 per cent indicated a minor in social science; 7 or 14.86 per cent indicated general science as their college minor; 7 or 14.86 indicated a minor in mathematics; 1 or 2.13 per cent indicated a minor in physical education; and 22 or 46.81 per cent of the mathematics teachers indicated no minor area of college preparation.

Graduate Field of Concentration of the Mathematics Teachers.-- The data on the graduate fields of concentration

of the mathematics teachers employed in the six Negro Senior High Schools in New Orleans, Louisiana, 1964-65, are presented in Table 11, page 37.

These data revealed that 3 or 6.39 per cent of the mathematics teachers indicated a major in administration; 6 or 12.78 per cent of them indicated a concentration in education; 4 or 8.52 per cent of the teachers indicated that they had majored in Guidance; 1 or 2.13 per cent of them indicated that they earned a major in Latin; 8 or 17.04 per cent of them indicated a graduate major in mathematics, and 25 or 53.19 per cent of these mathematics teachers indicated that they had done no graduate work.

Mathematics Teachers Reactions to Geometry as a Discipline.--Table 12, page 37, presents the response to the question: Did you Like Geometry, as obtained from the forty-seven mathematics teachers in the six Negro Senior High Schools in New Orleans, 1964-1965.

The data revealed that 46 or 97.87 per cent of the mathematics teachers did like geometry and 1 or 2.13 per cent did not like geometry when they studied it.

Mathematics Teachers Agreement with the Criteria for Objectives.--The data on the extent to which they agreed with the criteria for the objectives of mathematics instruction as traditionally or modernly expressed as indicated by the mathematics teachers in the six Negro Senior High Schools of New Orleans, 1964-1965 are presented in Table 13, page 38.

The objectives presented in Table 13 were divided,

TABLE 11

DISTRIBUTION OF THE FIELD OF CONCENTRATION OF THE MATHEMATICS TEACHERS AT THE GRADUATE LEVEL IN THE NEGRO SENIOR HIGH SCHOOLS IN ORLEANS PARISH, 1964-65

Field of Concentration	Number	Per Cent
Administration	3	6.39
Education	6	12.78
Guidance	4	8.52
Latin	1	2.13
Mathematics	8	17.04
No Graduate Work Indicated	25	53.19

TABLE 12

DISTRIBUTION OF THE RESPONSES TO THE QUESTION: DID YOU LIKE GEOMETRY? AS INDICATED BY THE FORTY-SEVEN MATHEMATICS TEACHERS IN THE NEGRO HIGH SCHOOLS OF NEW ORLEANS, 1964-65

Response	Number	Per Cent
Yes	46	97.87
No	1	2.13

7. to base the logical structure of geometry on the definition of all terms 23	17	7	48.93	36.21	4.29	100
8. to offer clues as how a proof may be obtained 38	7	2	80.85	14.86	4.29	100
9. to fuse instruction in plane and solid geometry 36	11	0	76.59	23.41	00.00	100
10. for the utilization of adequate present day algebra.....32	13	2	68.02	27.69	4.29	100
11. to promote mathematical creativity and insight to an understanding of deductive and inductive reasoning.....47	0	0	100.00	00.00	00.00	100
12. to emphasize adequately intuitively and "plausible reasoning" particularly in the development of spatial visualization 38	7	2	80.85	14.86	4.29	100
13. For the increase of geometrical instruments 27	13	7	57.45	27.69	14.86	100
14. to instill in the students an appreciation for the significance of logical demonstration 39	8	0	82.84	17.16	00.00	100
15. to acquaint the students with effective methods of clear, impartial thinking, criti-						

without actual identification, into three categories:

1. Strictly traditional
2. Traditional and Modern
3. Strictly modern

Of the four strictly traditional objectives, 2, 4, 5, and 7, the teachers indicated, 48.94 per cent, 68.02 per cent, and 74.47 per cent, respectively, disagreement as to the desirability of 2,4, and 5 being objectives of geometry. According to the responses, objective 7 was agreeable to 23 or 48.93 per cent of the mathematics teachers.

Of the six traditional and modern objectives 1, 11, 15, 16, 17, and 18, the teachers indicate that 38 or 80.85 per cant; 47 or 100 per cent; 39 or 82.84 per cent; 33 or 70.21 per cent; 41 or 87.13 per cent; 41 or 87.13 per cent agreement respectively, as to the desirability of all the above being effective objectives for geometry.

The mathematics teachers in the six Negro Senior High Schools of New Orleans, 1964-65 indicated agreement with the ten modern objectives 3,6,8,9, 10, 12, 13,14, and 19 as being desirable and effective objectives to be attained in geometry as shown by the 47 or 100 per cent, 38 or 80.85 per cent, 38 or 80.85 per cent36 or 76.59 per cent, 32 or 68.02 per cent, 38 or 80.85 per cent, 27 or 57.45 per cent, 39 or 82.84 per cent, and 38 or 80.85 per cent respectively agreement index.

Mathematics Teachers' Agreement with Suggested Procedures for Teaching Geometric Concepts.-- The data on the extent to which they agreed with the suggested procedures

for teaching the most desirable concepts as indicated by the Negro mathematics teachers in the six Negro Senior High Schools of New Orleans, 1964-65, are presented in Table 14, page 41. The procedures presented in Table 14 were divided into three categories:

1. Nine traditional Items
2. Three Traditional or Modern Items
3. Sixteen Modern Concepts Items

Of the nine traditional geometric conceptive items suggested for presentation the teachers indicated that concepts 1, 3, 11, and 27 were undesirable to the extent that 27 or 57.45 per cent, 35 or 74.47 per cent, 35 or 74.47 per cent, 39 or 82.98 per cent, and 39 or 82.98 per cent of them, respectively, disagreed as to the desirability of the above mentioned concepts. However, the traditional concepts identified by numbers , 10, 11, and 25 were desirable to the extent that 24 or 51.06 per cent, 29 or 61.70 per cent, 20 or 42.59 per cent, and 38 or 80.85 per cent of the teachers, respectively, agreed that these concepts mentioned immediately above were desirable.

Of the three traditional or modern geometric concepts 1, 6, and 22, the teachers indicated that 27 or 57.45 per cent, 35 or 74.47 per cent of them, respectively, disagreed as to the desirability of concepts 1 and 6 as items for useful procedures in the teaching of geometry.

The sisteen modern conceptual items 4, 5, 7, 9, 14, 15

17, 18, 20, 21, 22, 23, 26, and 28 were accepted as agreeable by the teachers to the extent that 27 or 57.45 per cent, 35 or 74.47 per cent, 23 or 48.93 per cent, 36 or 76.59 per cent, 29 or 61.70 percent, 39 or 82.98 per cent, 30 or 63.83 per cent, 38 or 80.85 per cent, 38 or 80.85 per cent, 36 or 76.50 per cent, 38 or 80.85 per cent, 38 or 80.85 per cent, 38 or 80.85 per cent, 47 or 100 per cent, 35 or 74.47 per cent of them, respectively, indicated agreement on these suggested procedures.

Methods of Teaching Found Most Applicable to the Teaching of Geometry.--The data on the extent to which the teachers found the methods most applicable to the teaching of geometry as indicated by the mathematics teachers in the Negro Senior High Schools of New Orleans, 1964-65, are presented in Table 14, page 42. These data show the significant facts indicated below.

The rank order of the teaching methods teachers indicated to be most applicable was as follows: heuristic, directed study, genetic, group-project, individual project and indivdualized instruction.

Ways of Evaluating Geometry Students Used by the Mathematics Teacher.--The data on the extent to which the teachers agreed upon the ways of evaluating students as indicated by the mathematics teachers in the Negro Senior High Schools in New Orleans, 1964-65, are presented in Table 16, page 43.

These data revealed that 47 or 100 per cent of the mathematics teachers indicated that the type of evaluation

TABLE 14

DISTRIBUTION OF THE EXTENT TO WHICH THE TEACHERS AGREE WITH THE SUGGESTED POSSIBLE PROCEDURES FOR TEACHING GEOMETRIC CONCEPTS AS INDICATED BY MATHEMATICS TEACHERS IN THE NEGRO SENIOR HIGH SCHOOLS OF NEW ORLEANS, 1964-65

	Geometric Concept	Agree	Disagree	Undecided	Per Cent Agreeing	Per Cent Disagreeing	Per Cent Undecided	Total
1.	define all terms from beginning to end	8	27	12	17.16	57.45	00.00	100
2.	introduce and use legitimate and standard symbols wherever possible	42	0	5	89.35	00.00	10.65	100
3.	study each type of triangle separately as a unit	11	35	1	23.41	74.46	2.13	100
4.	accept some terms without defining	27	11	3	57.45	23.41	19.14	100
5.	have students study and identify the complete set of triangles, then discover the differences between them	35	3	9	74.46	6.39	19.14	100
6.	refrain from the extensive use of symbolic representation of words and other elements peculiar to geometry,	3	36	9	6.39	74.47	19.14	100
7.	interpret a half-ray as a line	23	15	9	48.93	31.93	19.14	100
8.	let students discover the indisputable truth of certain basic statements based on the accepted undefined terms	36	10	1	76.59	21.28	2.13	100
9.	present postulates or axioms and require students to memorize them	24	16	7	51.06	34.08	14.86	100
10.	limit the amount of historical data	29	12	6	61.70	25.50	12.72	100
11.	ignore discussing the various regions of a triangle	7	35	5	14.86	74.47	10.67	100
12.	require students to solve geometric problems using formal methods of proof	33	14	0	70.21	29.79	00.00	100
13.	refrain from emphasizing the relationship of a statement converse, inverse and contrapositive	0	39	0	00.00	82.98	17.02	100
14.	the historical development of geometry should be emphasized at every appropriate opportunity	29	13	5	61.70	27.63	10.67	100
15.	the notion of sets should be used in definitions and theorems where appropriate.	39	4	4	82.98	8.51	8.51	100
16.	in problems, use proof statements concerning geometric figures	36	10	1	76.59	21.28	2.13	100
17.	permit students to solve problems informally as long as all necessary details are included	30	12	5	63.83	25.50	10.67	100
18.	the relationship between a statement and its' converse, inverse, and its' contrapositive should be emphasized	38	6	3	80.85	12.76	6.39	100
19.	indirect proofs should be used infrequently	20	15	12	42.59	31.91	25.50	100
20.	the transitive property of equality's should be used	38	5	4	80.85	10.67	8.48	100
21.	the concept of ordering numbers on the number line should be used	36	9	2	76.59	19.15	4.26	100
22.	plane geometry and some solid geometry should be combined to some extent.	38	7	2	80.85	6.39	12.76	100
23.	mathematical creativity and insight should be emphasized	38	3	6	80.85	6.39	12.76	100
24.	geometric, algebraic and arithmetical calculations should be used respectively according to their appropriateness	47	0	0	100.00	00.00	00.00	100
25.	logical formalism should be emphasized	38	9	0	80.85	19.16	00.00	100
26.	whenever a theorem is restricted to	38	3	6	80185	6.39	12.76	100
27.	only direct methods of proof should be used	2	39	6	4.26	82.98	12.76	100
28.	the properties of symmetry or reflexiveness	35	7	5	74.47	14.86	10.67	100

TABLE 15

DISTRIBUTION OF THE EXTENT TO WHICH THE TEACHERS AGREED UPON THE SUGGESTED METHODS MOST APPLICABLE TO THE PROMOTION OF LEARNING IN GEOMETRY AS INDICATED BY THE MATHEMATICS TEACHERS IN THE NEGRO SENIOR HIGH SCHOOLS OF NEW ORLEANS, 1964-65

	Agree	Disagree	Undecided	Per Cent Agreeing	Per Cent Disagreeing	Per Cent Undecided	Total
1. better results are obtained when instruction is individualized rather than taught with group procedures	29	18	0	61.70	38.30	00.00	100
2. the lecture method	16	23	8	34.08	48.93	16.99	100
3. the drill method	27	13	7	57.45	27.69	14.86	100
4. the individual project method	29	13	7	61.70	23.44	14.86	100
5. the group project	29	16	2	61.70	34.08	4.26	100
6. the heuristic method (a method which aims to lead the student, by well-chosen questions to discover facts and principles for himself rather than have them handed down to him.)	47	0	0	100.00	00.00	00.00	1000

TABLE 16

DISTRIBUTION OF THE RESPONSES, TO THE SUGGESTED POSSIBLE PROCEDURES OF EVALUATING TO DETERMINE THE EXTENT TO WHICH THE OBJECTIVES OF GEOMETRIC LEARNING HAS BEEN ACCOMPLISHED, OF THE MATHEMATICS TEACHERS IN THE NEGRO SENIOR HIGH SCHOOLS OF NEW ORLEANS, 1964-1965

	Agree	Disagree	Undecided	Per Cent Agreeing	Per Cent Disagreeing	Per Cent Undecided	Total Per Cent
1. the type of evaluation to be used depends upon the kind of information desired	47	0	0	100.00	00.00	00.00	100
2. pupils progress is evaluated continuously instead of at stated intervals	47	0	0	100.00	00.00	00.00	100
3. a variety of evaluation instruments and procedures should be used	47	0	0	100.00	00.00	00.00	100
4. the purpose of evaluating is to improve instruction	46	1	0	97.88	2.13	00.00	100
5. the purpose of evaluation is to inform the teacher of the child's progress of learning as well as the outcomes of learning	41	6	0	87.13	12.87	00.00	100
6. the features of geometry most important to measure are the systematic and logical order used by the pupil to solve a problem..	39	8	0	82.98	17.02	00.00	100
7. observation of one of the most valuable techniques of obtaining evidence of learning	36	11	0	76.59	23.41	00.00	100
8. the purpose of evaluation is to inform the student of how well he is doing in comparison with others	16	21	0	34.08	65.92	00.00	100
9. the purpose of evaluation is to motivate learning	38	9	0	80.85	19.15	00.00	100
10. the feature of geometry most important to measure is the ability to memorize	5	42	0	10.55	89.45	00.00	100
11. the interview should be used more as a means of evaluation ...	27	20	0	57.45	42.55	00.00	100
12. procedures and techniques for evaluating the outcome of geometry must keep pace with improved instructional procedures	47	0	0	100.00	00.00	00.00	100
13. standardized tests should be used because they are superior to teacher-made tests	8	39	0	17.02	82.98	00.00	100
14. pupils progress should be evaluated on the basis of a competitive marking system based on academic achievements..	28	19	0	59.57	40.43	00.00	100

depends upon the kind of information desired; 47 or 100 per cent indicated that evaluation should be continuously; 47 or 100 per cent indicated that a variety of evaluation instruments should be used; 46 or 97.87 per cent agreed that the purpose of evaluation is to improve instruction; 41 or 87.13 per cent indicated that the purpose of evaluation is to inform the teacher of the child's process of learning as well as the outcomes of learning; 39 or 82.98 per cent indicated the features of geometry most important to measure are systematic and logical order used by the pupils to solve problems; 36 or 76.59 per cent indicated that observation was a most valuable technique of obtaining evidence of leanning; 38 or 80.85 per cent indicated that the purpose of evaluation is to motivate learning; the interview as a means of evaluation was agreed on by 27 or 57.45 per cent; 100 percent of the teachers indicated that evaluating the outcome of geometry must keep pace with improved instructional procedures; 39 or 82.98 per cent of the teachers disagreed that standardized test should be used because they are superior to teacher-made tests; and 28 or 57.57 per cent of the mathematics teachers agreed that pupils' progress should be evaluated on the basis of a competitive marking system based on acedemic achievements.

CHAPTER IV

SUMMARY AND CONCLUSIONS

Introductory Statement.--The problem of this research has been threefold: first, to identify selected status-factors of the teacher-personnel; second, to determine the opinion about teaching of geometry which was held by the teacher-personnel; and third, to ascertain to what extent the opinions held by mathematics teachers of Orleans Parish, Louisiana, 1964-1965, can be utilized in evaluating the scope and nature of improvement, if any.

The conclusions, implications, and recommendations inherent in this completed research have been derived from the analysis and interpretation of the data which were gathered through the execution of the data-gathering questionnaire by the forty-seven Negro mathematics teachers in New Orleans, 1964-1965.

Purpose of the Study.-- The overall purpose of the study was to ascertain the personnel status of mathematics teachers and to identify their opinions about the changes being brought about in the teaching of geometry as expressed by the mathematics teacher-personnel in the six Negro High Schools in Orleans Parish, Louisiana, 1964-1965.

The specific purposes of the study were as follows:

1. To determine the teacher-personnel status of the mathematics teachers.
2. To determine the opinions about the changes in the teaching of geometry.
3. To ascertain to what extent the opinions held by mathematics teachers can be utilized in evaluating the scope and nature of improvement in the effectiveness of one concept of geometry over the other.

Definition of terms.--For the purpose of clarity, certain terms used were found as follows:

1. Opinions refer to the judgment held as true and arrived at by intellectual process though not necessarily based on evidence sufficient for proof.

Research-design of study.--Significant aspects of the research-design of this study are outlined below.

1. Locale- The field work and correspondence necessary for conducting this research was carried out among the Negro Senior High School mathematics teachers in New Orleans.
2. Method of Research- The Descriptive-Survey Method of research, employing the technique of the questionnaire and interviews, where possible, was used to gather the data pertinent to this study.
3. Instruments- The instrument used in gathering the data for this research was a specifically constructed questionnaire-checklist which was designed to collect data on the status of teacher-personnel and the opinions held by its members in the teaching of geometry.
4. Subjects- The subjects for this study were forty-seven mathematics teachers of the six Negro Senior High Schools of Orleans Parish, Louisiana.

5. Period of the Study- This research was carried out during the school year 1964-1965.

6. Criteria of Reliability- The criteria of reliability for appraising the data was the accuracy of the responses of the subjects to the items on the questionnaire-checklist.

7. Operational Steps- The following operational steps were used in conducting this research:

    a. Permission was secured to conduct this study.

    b. The related literature pertinent to this research was reviewed, summarized and is presented in the finished thesis copy.

    c. The data derived from the instrument was tabulated, assembled into appropriate tables, analyzed and interpreted in keeping with the nature of the research.

    d. The findings, conclusions, implications, and recommendations derived from the analysis and interpretation of the data are included in the finished thesis copy.

Summary of Related Literature.-- The summarization and interpretation of related literature pertinent to this research are presented in the statements to follow:

1. The nature and purpose of geometry is to make clear to the meaning of a demonstration and a proof. Also, to give the student an opportunity to do some deductive thinking.

2. Geometry functions to instill in the student an appreciation for logical demonstration, and to make him aware of an effective way of clear and impartial thinking.

3. National committees on the Secondary Schools furnishes leadership for the direction of mathematical education in the United States; it provides statements of objectives, aims and suggestions of organizing subject matter in mathematics.

4. The objectives of Geometrical Instruction in the Secondary Schools are to give the student an understanding of geometric forms, to develop an understanding of deductive and inductive methods of reasoning and to provide for original and critical thinking by students.

5. Of the various methods of teaching, the heuristic method with small groups was suggested as being the best. Other methods, lecture and laboratory, could be used in combinations.

6. Another method known as the recitation and homework method was indicated, but considered not to be too good for most students.

7. The survey of literature indicated that blackboard compasses, protractors, and rulers were indispensable items in the classroom.

8. The purposes of evaluation should not be used only for assigning marks but to maintain standards, to discover strengths and weaknesses of individual pupils or of the class as a whole, to select and reject pupils, and to motivate students to study.

9. Since teaching geometry is primarily the responsibility of the mathematics teachers in these schools, they should be trained sufficiently.

Basic Findings

Summary of basic findings.-- The summary of basic findings of this research which dealt with significant factors of the teacher-personnel; and the comparative opinions toward the teaching of geometry held by the mathematics teachers of the six Negro High Schools of Orleans Parish, Louisiana, 1964-1965, are represented below under the appropriate data captions:

Number of teachers in Mathematics Departments — Table 1

The number of teachers in the Mathematics Departments of the schools ranged from a low of 4 or 9.78 per cent of the total faculty of 92 to a high of 9 or 15.51 per cent of the total faculty of 58.

Number of Teachers Teaching Geometry — Table 2

The number of mathematics teachers teaching geometry of the Mathematics Departments range from a low of 1 or 11.11 per cent of 9 in the department to a high of 7 or 77.77 per cent of i in the department.

Enrollments of the Schools and Mathematics Departments — Table 3

Enrollments in the schools ranged from a low of 479 to a high of 2738. Enrollments in the Mathematics Departments ranged from a low of 690 or 50.50 per cent to a high of 449 or 91.65 per cent.

Enrollments of Mathematics Students in Geometry Classes — Table 4

Enrollments of mathematics students in geometry classes ranged from a low of 145 or 7.55 per cent to a high of 1050 or 79.26 per cent.

Mathematics Teachers having Attended National Science Foundation Institutes — Table 5

It was found that 22 or 46.81 per cent had attended National Science Foundation Institutes.

Academic Levels Attained by the Mathematics Teachers — Table 6

It was revealed that 43 or 91.42 per cent hold

It was revealed that 43 or 91.42 per cent hold Bachelor degrees while 4 or 8.58 per cent hold Master degrees.

Ages of Mathematics Teachers — Table 7

The data revealed that 5 or 10.64 per cent of the mathematics teachers were over 56 years of age, and 5 or 10.64 per cent were under 25 years of age. The majority, 18 or 38.30 per cent ranged from 26-30 years of age.

College Mathematics Courses Taken by Mathematics Teachers — Table 8

The major findings revealed that 47 or 100 per cent had taken college algebra, 32 or 68.08 per cent had taken differential calculcus, and 28 or 59.56 per cent had taken plane trigonometry, and 22 or 46.81 per cent had taken integral calculus.

Majors and Minors of Mathematics Teachers — Table 9 and 10

This study revealed that only 23 or 48.94 per cent of the mathematics teachers had majored in mathematics. Other ranking subjects majored in by mathematics teachers were: general science, social science, chemistry, English, biology, music, and foreign language.

It was significant to note that 7 or 14.86 per cent had minored in mathematics, 7 or 14.86 per cent minored in general science, and 5 or 10.64 per cent minored in social science. Other ranking subjects minored in by mathematics teachers include: biology, French, Chemistry, and physical education.

Fields of Concentration of Mathematics Teachers at the Graduate Level — Table 11

It was noted that none of the mathematics teachers concentrated on mathematics at the graduate level.

Did You Like Geometry? — Table 12

It was found that all but 1 of the mathematics teachers liked geometry.

Responses to Suggested Objectives of Geometry — Table 13

The data on the suggested objectives of geometry which consisted of traditional and modern objectives re-revealed that (1) out of 4 traditional objectives

presented, only 1 was agreed by a majority, i.e., 23-17, (2) out of the 6 traditional and modern objectives, all were agreeable upon as acceptable and all of the modern objectives were accepted as agreeable.

Response to Suggested Procedure for Teaching Geometry — Table 14

It was found that of the suggested procedure for teaching geometry, 9 traditional, 3 traditional or modern, and 4 of traditional were acceptable, 2 or the traditional or modern and all of the modern suggested procedures were accepted as correct procedure.

Methods of Teaching Used — Table 15

The study revealed that the teaching methods ranked as follows: heuristic, directed study, genetic, group-project, individual project, individualized instruction, drill and lecture method.

Evaluation of Geometry Instruction — Table 16

It was found that "score on teacher-made tests" was used by the majority of teachers for evaluating pupils more than any of the other ways used. The rank order of the "ways of evaluating pupils" as used by these geometry teachers was found to be follows: scores on teacher-made tests, oral recitation, written assignments, and to some extent commercially produced tests. Also, the majority of the geometry teachers felt that evaluation was not for the primary purpose of grading the students but to get an estimation of the student's progress.

Conclusions.-- It would appear that the analysis of the data of this research would warrant the conclusions to follow:

1. The geometry classes approximate the optimum size as prescribed by authorities, with the exception of one.

2. That there seemed to have been no set pattern of assigning or having students elect geometry.

3. Those mathematics teachers who were found teaching geometry had a broad liberal type of training in mathematics but did not have enough depth of training in geometry.

4. The geometry program of the Negro Senior High Schools in New Orleans, 1964-1965, are to an average degree, in agreement with general objectives of geometry as set up by authorities in the field.

5. The geometry teachers are using to a high degree a variety of accepted methods of teaching.

6. The heuristic approach of teaching was the favorite.

7. Teachers seemed to be using a variety of methods for evaluating student's progress in geometry.

Implications.--A close examination and interpretation of the data of this research would appear to justify the following implications:

1. It is apparent that the geometry teachers in the Negro Senior High Schools of New Orleans, 1964-1965, are in the process of improving themselves as evidenced by their continued training (academic and professional) at the graduate level.

2. The interest, versatility and/or aptitude tends not to offset or overcome the disadvantage of inadequate formal preparation in geometry.

3. The curriculum directors in the Orleans Parish School District appeared to be fully cognizant of and followed the criteria of mathematics authorities in the inauguration of the mathematics programs for the schools.

4. The mathematics teachers were reasonably knowledgeable about the critical factors that enter into the appraisal of student progress; for they overwhelmingly indicated fully agreement in the use of time-tested means and procedures of measuring student achievement.

Recommendations.--The analysis and interpretation of the data, with specific reference to conclusion thereof, would justify the following recommendations:

1. That geometry teachers should not be assigned more than two different mathematics subjects in order that the instruction in the geometry program may be kept at a high level and not have too many "preparations" to make.

2. That teacher-personnel assigned to teach geometry be selected on the basis of their preparation in geometry.

3. That a study be made to determine if greater unity and consistency can be achieved in assigning pupils to geometry classes.

4. That more mathematics teachers should participate in mathematics institutes.

5. That inadequately prepared teachers of geometry should secure more formal training in geometry.

6. That class loads should be kept at the number prescribed by authorities.

BIBLIOGRAPHY

Books

Birkoff, George and Beatley, Ralph. Basic Geometry. New York: Chelsea Publication Company, 1959.

Butler, Charles H. and Wren, Lynwood F. Teaching of Secondary Mathematics. New York: McGraw*-Hill Book Company, 1951.

Commission on Secondary School Curriculum of the Progressive Education Association. Mathematics in General Education. Report of the Committee on the Function of Mathematics in General Education. New York: Appleton-Century-Croft, Inc., 1940.

Davis, David R. The Teaching of Mathematics. Cambridge: Addison-Wesley Press, Inc., 1951.

Douglass, Earl R. and Mills, Hubert H. Teaching in High School. New York: The Ronald Press Company, 1948.

Fifteenth Yearbook of the National Council of Teachers of Mathematics. The Place of Mathematics in Secondary Education. New York: Bureau of Publications, Teachers College, Columbia University, 1940.

Reeve, William David. Mathematics for the Seoondary School. New York: Henry Holt and Company, 1954.

Articles

Beckmann, Milton W. "Is General Mathematics or Algebra Providing Greater Opportunity to Attain the Recommended Mathematical Competencies?" Journal of Educational Research, XLVII (1954), 19-54.

Betz, William. "Five Decades of Mathematical Reform: Evaluation and Challenge." The Mathematics Teacher, XLIII (1950), 377-87.

Betz, William. "The Transfer of Training, with Particular Reference to Geometry." In the Teaching of Geometry, Fifth Yearbook, National Council of Teachers of Mathematics. Teachers College (1930). 149-98.

Bond, Williams E. "The Aims in Teaching Geometry and How to Attain Them," The Mathematics Teacher, I, (1908), 30-36.

Brown, Kenneth E. "Why Teach Geometry?" The Mathematics Teacher, XLIII. (November, 1950), 103-106.

Challman, Mildred. "The Retention of Arithmetic and Algebra in Relation to Achievement in Plane Geometry." The Mathematics Teacher,XXXIX, (May, 1946).

College Entrance Examination Board, Document 108 Definition of the Requirements in Geometry. New York: College Entrance Examination Board, (1923).

Council for Basic Education, "Early Stress on Mathematics Urged." The New York Times, (November 8, 1959), 9:3.

Davis, Robert A. and Henrick, Margurite. "Predicting Accomplishment in Plane Geometry." School Science Mathematics. (May, 1945), 403-4.

Grossman, George. "A Report of National Science Foundation Summer Institutes in Mathematics for High School Students at Columbia," The Mathematics Teacher, LIV. (February, 1961), 75-81.

Hendrix, Gertrude. "Learning by Discovery." The Mathematics Teacher, LIV. (May, 1951),290-99.

Hoag, Jessie M. and Loflin, Zeke L. "Goals in Geometry." National Association of Secondary School Principals, XXXVIII. (October, 1954), 13-19.

Jackson, Robert. "The Development of a Concept: A Demonstration Lesson," The Mathematics Teacher, LIV. (February, 1961), 82-84.

Lanzor, Nathan. "The Importance of Certain Concepts and Laws of Logic for the Study and Teaching of Geometry." The Mathematics Teacher, XXXI (November, 1938), 99-113, 156-75, 216-40.

Maul, Ray C. "Let's Look at the New Mathematics and Science Teachers." The Mathematics Teacher, LI (November, 1958), 531-534.

Meder, Albert E. Jr. "The Ancients Versus the Moderns- A Reply." The Mathematics Teacher, LI (October, 1958), 428-433.

Monroe, Walter S. Encyclopedia of Educational Research. New York: The MacMillan Company, 1950.

Unpublished Materials

Blackshear, John S. "The Relative Effectiveness of Teaching Two Methods in Biology." Thesis, Atlanta University, 1956.

VITA

Name:	Irvin J. Franklin
Education:	Elementary-Valena C. Jones, Elementary School, New Orleans, Louisiana Secondary- Leland College High School, Baker, Louisiana College-Dillard University, New Orleans, Louisiana
Experience:	United States Army, Quartermaster Supply Sergeant Social Studies Teacher, 1950-1951, New Orleans, Louisiana Mathematics Teacher, 1951-, New Orleans, Louisiana
Fields of Concentration:	Undergraduate-Social Studies, General Science, Mathematics, and Education Graduate- Mathematics and Education
Personal Information:	Married, five children. Member of the Brooks Methodist Church, A.M.E., New Orleans, Louisiana; Louisiana Education Association, Inc.; First District Louisiana Education, Inc.; and the National Council of Teachers of Mathematics. Also first President of Louisiana Education First District Federal Credit Union

APPENDIX

TEACHER" OPINIONS OF THE RELATIVE EFFECTIVENESS OF TWO CONCEPTS IN THE TEACHING AND LEARNING OF GEOMETRY

Questionnaire

Frame-of-Reference

Changes in secondary school curricula have introduced new concepts and enriched traditional ones. Geometry, once thought of as a disciplinary subject, has come to be considered as a necessary tool to the understanding of, and control over one's environment. An examination of the existing and proposed programs of instruction for this subject shows many deviations from traditional concepts to its teaching and learning.

Directions

This questionnaire was designed to obtain your opinion as to the relative merits of the "traditional" and "modern" approaches to instruction and learning in geometry. It is felt that such an evaluation will make a great contribution to the field of mathematics education generally and specifically to the area of geometric instruction.

Please read the following questions and place a check mark ( ) by the answer which in your opinion correctly answers the question in the light of your knowledge and experience.

When the questions have been properly completed, please return the questionnaire in the enclosed stamped self-addressed envelope to:

Irvin J. Franklin
1423 Senate Street
New Orleans, Louisiana 70122

Thank you for very much for your prompt attention to this matter.

Irvin J. Franklin

PART I

Background

Please fill in the blank space provided for your response

1. Name of school in which you work/worked_____

_____

2. Address of above named school_____
street

_____
city county state

3. Number of teachers in entire school_____

4. Number of teachers in the mathematics department____

5. Number of teachers teaching mathematics this year___

6. Number of teachers teaching geometry this year_____

7. Did you teach geometry the last school term 1962-63?

_____

8. Did you teach geometry prior to 1957?_____

9. Are you teaching geometry this school term 1963-64___

10. Total enrollment in your school_____

11. Total enrollment in all mathematics courses taught in your school_____

12. Number of students in your geometry class or classes_

_____

13. Number of sections of geometry you teach_____

14. Courses, other than geometry you teach_____,_____,

_____,_____,_____

15. Have you attended a National Science Institute in Mathematics?_____

PART II

Personal Information

1. What courses in mathematics do you teach? (a)_____

   (b)_____(c)_____(d)_____

   (e)_____(f)_____(g)_____

2. Sex: Male_____Female_____

3. Education (Check highest year)

   A. Undergraduate
      (1) Freshman_____
      (2) Sophomore_____
      (3) Junior_____
      (4) Senior_____

      _____
      (Name of College)

      _____
      (Location of College)

   B. Graduate
      (1) One Semester_____
      (2) Two Semesters_____
      (3) Other (Specify)_____
      (4) Degree Received_____

      _____
      (Name of University)

      _____
      (Location of University)

   C. Post-Graduate
      (1) One Semester_____

      _____
      (Name of University)

      (2) Two Semesters_____
      (3) Other(Specify)_____
      (4) Degree Received_____

      _____
      (Location of University)

4. Check your age group.

   A. 25 years or younger_____
   B. 26-35_____
   C. 36-45_____
   D. 46-55_____
   E. 56 or more_____

5. List the courses in education you have completed with the approximate number of semester hours in each.

Courses	Hours

6. List the courses in mathematics you have completed with the approximate number of semester hours.

Courses	Hours

7. State your undergraduate major _____

8. State your undergraduate minor _____

9. State your fields of concentration at the graduate level _____, _____, _____

10. Did you like geometry? _____

PART III

General Considerations

A. Geometric Objective

In this section you are to indicate your opinion about what the objectives of geometry should be. Please respond to the following general statements by placing a check under columna "A: if you Agree with the statement, or check under column "D" if you Disagree.

The objectives of a course in geometry should be:

		A	D
1.	to emphasize mathematical understanding	_____	_____
2.	to prepare students for general philosophical studies	_____	_____
3.	to emphasize logical form	_____	_____
4.	a presentation of carefully selected topics related to philosophical orientation	_____	_____
5.	to exclude practical applications of geometry	_____	_____
6.	to help students to conceive and conjecture possible results beginning proof	_____	_____

	A	D
7. to base the logical structure of geometry on the definition of terms	_____	_____
8. to offer clues as to how a proof may be obtained	_____	_____
9. to fuse instruction in plane and solid geometry	_____	_____
10. for the utilization of present-day algebra	_____	_____
11. to promote mathematical creativity and insight, by understanding deductive and inductive reasoning	_____	_____
12. to emphasize adequately intuitive and "plausible reasoning" particularly in the development of spatial visualization	_____	_____
13. for the increased use of geometrical instruments	_____	_____
14. to instill in the students an appreciation for the significance of logical demonstration	_____	_____
15. to acquaint the students with effective methods of clear, impartial thinking, critical evaluations, and intelligent generalizations	_____	_____
16. to introduce the students to the meaning of mathematical rigor and precision	_____	_____
17. to aid students in acquiring the ability to think logically	_____	_____
18. to make sure that the student has an informed, intuitive familiarity with simple geometric configurations	_____	_____

		A	D
19.	to develop within the student a concept of definitions and appreciations of the role of undefined words	_____	_____
20.	If in your opinion there are some objectives which should be added, please add them in the space below		

B. Geometric Concepts

This portion of the questionnaire is concerned with concepts, which will or will not aid in the achievement of the desired objective of an adequate course in geometry. Please respond to each statement as you did previously.

The most desirable concepts should be to:

		A	D
1.	define all terms from beginning to end	_____	_____
2.	introduce and use legitimate and standard symbols wherever possible	_____	_____
3.	study each type of triangle separately as a unit	_____	_____
4.	accept some terms without defining	_____	_____
5.	have students study and identify the complete set of triangles, then discover the differences between them	_____	_____

	A	D
6. refrain from the extensive use of symbolic representation of words and other elements peculiar to geometry	_____	_____
7. interpret a half-line as a ray	_____	_____
8. let students discover the indisputable truth of certain basic statements based on the accepted undefined terms	_____	_____
9. present postulates or axioms, and require students to memorize them	_____	_____
10. limit the amount of historical data	_____	_____
11. ignore discussing the various regions of a triangle	_____	_____
12. require students to solve geometric problems using formal methods of proof	_____	_____
13. refrain from emphasizing the relationships of a statement's converse, inverse and contrapositive relations	_____	_____
14. emphasize the historical development of geometry	_____	_____
15. use the notion of sets in definitions and theorems wherever appropriate	_____	_____
16. use proof statements concerning geometric figures in problems	_____	_____
17. permit students to solve problems informally as long as all necessary details are included	_____	_____
18. emphasize the relationship between a statement and its' converse, inverse, and its' contrapositive	_____	_____
19. indirect proofs should be used infrequently	_____	_____
20. the transitive property of equality should be used	_____	_____

	A	D
21. the concept of ordering numbers on the number line should be used	____	____
22. plane geometry and some solid geometry should be combined to some extent	____	____
23. mathematical creativity and insight should be emphasized	____	____
24. whenever a theorem is restricted to a particular dimension, it should so specify	____	____
25. logical formalism should be emphasized	____	____
26. geometric, algebraic and arithmetical calculations should be used respectively according to their appropriateness	____	____
27. only direct methods of proof should be used	____	____
28. the properties of symmetry or reflexiveness	____	
29. if in your opinion, there are some more concepts which should be added to the questionnaire, please feel free to add as many as you desire.		

C. Relationship of Geometry to other subjects

Opportunities for using geometry exist in many areas of the high school curriculum. What are you doing toward the teaching of geometry in connection with other areas of the high school curriculum?

In my teaching I find that:

		A	D
1.	problem solving is a major objective of geometry and other areas well	_____	_____
2.	the child who has difficulty in reading also has difficulty in getting understanding from his work, and in written instructions	_____	_____
3.	many opportunities to relate geometry to other areas occur. State a few, please: _____, _____, _____ _____, _____, _____		
4.	the child who is able to solve problems independently in geometry is also able to solve problems in other subject areas rather fluently	_____	_____
5.	many opportunities to relate geometric experiences occur in art, mechanical drawing, metal, woodworking, and brick masonry	_____	_____
6.	opportunities for teaching geometry in classroom experiences related to the physical world and an understanding of it. If possible, state _____ _____ _____ _____		
7.	in the area of physical training, there exist many opportunities to use gometry	_____	_____
8.	if the learner is able to relate experiences from one area to another, then he has understood what has been done	_____	_____

	A	D
9. geometric experiences can be closely associated with problems pertaining to his physical and social well being	_____	_____
10. instruction can be carried out in close association with all school work where quantitative procedure can clarify the situation	_____	_____
11. if there are any others, please add them below.		

D. Organization and Level of Performance Placement

This part of the questionnaire is concerned with the organization of content and level of performance placement of students. Your choice of the statement below will indicate this.

The content of a geometry program, and level of performance placement of students should be:

	A	D=
1. determined from an analysis of textbooks that are used	_____	_____
2. organized on three group levels- above average-average-below average	_____	_____
3. grouped in respect to some social framework	_____	_____
4. influenced by standardized tests	_____	_____
5. organized systematically according to geometrical relations	_____	_____

	A	D
6. determined by state and local courses of study	_____	_____
7. organized on a differentiated basis	_____	_____
8. influenced by the teaching staff's concept of the nature of the learning process	_____	_____
9. organized in an upgraded sequence according to tests and ability	_____	_____
10. determined by reports of professional commissions and committees	_____	_____
11. influenced by the present need of society	_____	_____
12. influenced by the future need of society	_____	_____
13. so that formal geometry is taught in the tenth grade	_____	_____
14. if there are any other procedures, please add below:		

E. Methods

What methods have you found most applicable to the promotion of learning in geometry?

In the promotion of learning in geometry, I find that:

	A	D
1. better results are obtained when instruction is individualized rather than taught with group procedures	_____	_____

		A	D
2.	the lecture method	_____	_____
3.	the drill method	_____	_____
4.	the individual project method	_____	_____
5.	the group project	_____	_____
6.	the heuristic method(a method which aims to lead the student, by well-chosen questions, to discover facts and principles for himself rather than have them handed out to him.)	_____	_____
7.	the genetic method (a method in which the questions are directed to the entire class instead of one individual).	_____	_____
8.	the directed study method (a method in which the teachers actually aids students in class who need help in doing the assignment).	_____	_____
9.	others: please state below:		

F. Evaluation

Evaluation is concerned with determining the extent to which the objectives of geometric learning have been accomplished. Your opinion in evaluation is desired in this section.

		A	D
1.	the type of evaluation to be used depends upon the kind of information desired	_____	_____

		A	D
2.	pupils progress is evaluated continuously instead of at stated intervals	_____	_____
3.	a variety of evaluation instruments and procedures should be used	_____	_____
4.	the purpose of evaluation is to improve instruction	_____	_____
5.	the purpose of evaluation is to inform the teacher of the child's process of learning as well as the outcomes of learning	_____	_____
6.	the features of geometry most important to measure are the systematic and logical order used by the pupils to solve a problem	_____	_____
7.	observation is one of the most valuable techniques of obtaining evidence of learning	_____	_____
8.	the purpose of evaluation is to inform the student of how well he is doing in comparison with others	_____	_____
9.	the purpose of evaluation is to motivate learning	_____	_____
10.	the feature of geometry most important to measure is the ability to memorize	_____	_____
11.	the interview should be used more as a means of evaluation	_____	
12.	procedures and techniques for evaluating the out-come of geometry must keep pace with improved instructional procedures	_____	_____
13.	standardized tests should be used because they are superior to teacher-made tests	_____	_____

	A	D
14. pupils' progress should be evaluated on the basis of a competitive marking system based on academic achievements	_____	_____

15. others: Please state below: